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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/502,071	07/19/2004	Dennis W. Prather	00131-00288-US2	2021
66469 7590 12/06/2007 RATNERPRESTIA P.O. BOX 1596 WILMINGTON, DE 19899			EXAMINER PETKOVSEK, DANIEL	
			ART UNIT 2874	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/502,071

Applicant(s)

PRATHER ET AL.

Examiner

Daniel J. Petkovsek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on RCE amendment filed November 2, 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

This office action is in response to the RCE amendment filed November 2, 2007. In accordance with the amendment, claims 1, 4-8, 11-15, 18-22, 25-28, 30, 31, 33, 34, 36, 37, and 39 have been amended.

Claims 1-41 are pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 2, 2007 has been entered.

Claim Objections

2. Claim 15 is objected to because of the following informalities: in the last sub-paragraph, "respective" is spelled "respative". Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 4-9, 11-16, 18-23, and 25-41 are rejected under 35

U.S.C. 102(b/e) as being anticipated by Fan et al. U.S.P. No. 6,512,866 B1.

Fan et al. U.S.P. No. 6,512,866 B1 teaches (ABS, Figs. 3, 8, 13, 16-20, 23A, 28, column 6, lines 9-26, column 7, line 57 through column 8, line 27) an electro optic switch (and inherent method of using same) comprising: a non-piezoelectric photonic crystal material 302 having first 304 and second 306 waveguides separated by a region of photonic crystal, each of the 1st and 2nd waveguides having 1) a respective input portion and a respective output portion and 2) a coupling length where the first waveguide 304 is proximate to the second waveguide 306, and either electrical or optical means for inducing a change in conductance in the region of the photonic crystal along the coupling length (see, e.g. column 9, lines 1-17), wherein the respective input portions are unconnected to each other, and the switch is configured such that the change in the conductance produces electro-optic switching between the first and second waveguides, which clearly, fully which clearly, fully meets Applicant's claimed limitations.

Regarding independent claims 8 and 15, the photonic crystal waveguide structure inherently has a photonic bandgap.

Regarding independent claims 30, 33, 36, and 39, electron-hole pairs are inherently generated during the optical induced absorption as described (see

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Figs. 26, column 20, line 60 through column 21 line 20). Further, the claim limitation "wherein the change in conductance along the coupling length is *optically induced by electron-hole pair generation*" is an intended use of the device without any structural claim limitations that would accomplish the result. It has been held that a recitation with respect to the manner in which a claimed *apparatus* is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ 1647 (1987).

Regarding claims 2, 9, 16, and 23, photonic crystal is arranged in square lattice structure.

Regarding claims 4-7, 11-14, 18-21, and 25-28, the propagation constants of the 1st and 2nd waveguides can be equivalent and couple to each other all optical wavelengths in the *symmetrical* arrangements as shown in Fig. 3, etc.

Regarding claims 29, 32, 35, 38, injection of current is disclosed (column 19, lines 28-43), which inherently has charge "carriers".

Regarding claims 31, 34, 37, and 40, the control of Fan et al. '866 serves to *modulate* the coupling of the device.

Regarding claim 41, the optical absorption coefficient will inherently change when the device of Fan et al. '866 is electrically controlled to actuate an optical switching function.

5. Claims 1-38, 40, and 41 are rejected under 35 U.S.C. 102(b/e) as being anticipated by Allan et al. US 2002/0021878 A1.

Allan et al. US 2002/0021878 A1 (currently U.S.P. No. 6,674,949 B2) teaches (Fig. 25, [0064]) an electro optic switch (and inherent method of using same) comprising: a non-piezoelectric photonic crystal material having first 170 and second 172 waveguides separated by a region of photonic crystal, each of the 1st and 2nd waveguides having 1) a respective input portion and a respective output portion 175 and 2) a coupling length where the first waveguide 170 is proximate to the second waveguide 172, and either electrical or optical means for inducing a change in conductance in the region of the photonic crystal along the coupling length, wherein the respective input portions are unconnected to each other, and the switch is configured such that the change in the conductance produces electro-optic switching between the first and second waveguides, which clearly, fully which clearly, fully meets Applicant's claimed limitations.

Regarding independent claims 8 and 15, the photonic crystal waveguide structure has a photonic bandgap (see ABS).

Regarding independent claims 30, 33, and 36, the claimed structure of each claim is met by the structure of Allan et al. '878. The claim limitation "wherein the change in conductance along the coupling length is *optically induced by electron-hole pair generation*" is an intended use of the device without any structural claim limitations that would accomplish the result. It has been held that a recitation with respect to the manner in which a claimed *apparatus* is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ 1647 (1987).

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Regarding claims 2, 3, 9, 10, 16, 17, 23, and 24, photonic crystal square and hexagonal lattices are disclosed ([0007]-[0010]).

Regarding claims 4-7, 11-14, 18-21, and 25-28, the propagation constants of the 1st and 2nd waveguides are equivalent and couple to each other all optical wavelengths in the *symmetrical* arrangements as shown in Fig. 25 ([0064]).

Regarding claims 29, 32, 35, 38, injection of current is disclosed ([0018]), which inherently has charge "carriers".

Regarding claims 31, 34, 37, and 40, the control of Allan et al. '878 serves to *modulate* the coupling of the device.

Regarding claim 41, the optical absorption coefficient will inherently change when the device of Allan et al. '878 is electrically controlled to actuate an optical switching function.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 10, 17, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. U.S.P. No. 6,512,866 B1 as applied to claims 1, 8, 15, and 22 above, and further in view of Allan et al. US 2002/0021878 A1.

Fan et al. U.S.P. No. 6,512,866 B1 teaches (ABS, Figs. 3, 8, 13, 16-20, 23A, 28, column 6, lines 9-26, column 7, line 57 through column 8, line 27) an

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electro optic switch (and inherent method of using same) comprising: a non-piezoelectric photonic crystal material 302 having first 304 and second 306 waveguides separated by a region of photonic crystal, each of the 1st and 2nd waveguides having 1) a respective input portion and a respective output portion and 2) a coupling length where the first waveguide 304 is proximate to the second waveguide 306, and either electrical or optical means for inducing a change in conductance in the region of the photonic crystal along the coupling length (see, e.g. column 9, lines 1-17), wherein the respective input portions are unconnected to each other, and the switch is configured such that the change in the conductance produces electro-optic switching between the first and second waveguides.

Fan et al. '866 does not *explicitly* teach that the photonic crystal comprises a periodic array of air holes arranged in a *hexagonal lattice* (claims 3, 10, 17, and 24).

Allan et al. US 2002/0021878 A1 (currently U.S.P. No. 6,674,949 B2) teaches (Fig. 25, [0064]) an electro optic switch (and inherent method of using same) comprising: a non-piezoelectric photonic crystal material having first 170 and second 172 waveguides separated by a region of photonic crystal, each of the 1st and 2nd waveguides having 1) a respective input portion and a respective output portion 175 and 2) a coupling length where the first waveguide 170 is proximate to the second waveguide 172, and either electrical or optical means for inducing a change in conductance in the region of the photonic crystal along the coupling length, wherein the respective input portions are unconnected to each

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other, and the switch is configured such that the change in the conductance produces electro-optic switching between the first and second waveguides. Allan et al. '878 also teaches the arrangement of photonic crystal in hexagonal lattices ([0007]-[0010]).

Since Fan et al. '866 and Allan et al. '878 are both from the same field of endeavor, the purpose disclosed by Allan et al. '878 would have been recognized in the pertinent art of Fan et al. '866.

A person having ordinary skill in the art at the time the invention was made would have recognized the teaching of Allan et al. '878, to use specific types of photonic crystal that have *hexagonal* lattice structure, for the purpose of improving optical signal characteristics of the photonic crystal and allowing for improved switchability of the apparatus of Fan et al. '866.

Response to Arguments

8. Applicant's arguments filed November 2, 2007 have been fully considered but they are not persuasive.

9. Applicant traverses the rejections made to Allan et al. '878 by asserting that Allan et al. '878 does not teach "first and second waveguides separated by a region of the photonic crystal...electrical or optical means for inducing a change in conductance in the region of the photonic crystal along the coupling length". Further, Applicant continues to assert that the current invention differs from Allan et al. '878 because it comprises a means for changing the optical properties of the actual defect waveguide region itself (see RCE amendment filed November 2, 2007, page 10). The Examiner respectfully disagrees with these assertions.

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10. Again, Applicant gives too narrow of an interpretation to "coupling length" and "in the region". Clearly, the "*coupling length*" and "*in the region*" can encompass a broader definition that Applicant wishes to label it with. Further, the electric field as described by Allan et al. '878 will *inherently* induce a change in conductance in the region of the photonic crystal that separates the 1st and 2nd waveguides 170 and 172. These effects, although they may be secondary, still meet Applicant's ***claimed*** limitations.

11. Further, in view of the new claim amendments presented on November 2, 2007, a new rejection has been made to Fan et al. '866, which is fully addressed in the 35 U.S.C. 102 (b/e) and 35 U.S.C. 103 (a) rejections to claims 1-41 above.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J. Petkovsek whose telephone number is (571) 272-4174. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Daniel Perkovsek
December 4, 2007

/Tina Wong/
Tina M. Wong
Primary Examiner
AU 2874